

Toward computational algorithm for time-fractional Fokker–Planck models

Abstract: This article describes an efficient algorithm based on residual power series to approximate the solution of a class of partial differential equations of time-fractional Fokker–Planck model. The fractional derivative is assumed in the Caputo sense. The proposed algorithm gives the solution in a form of rapidly convergent fractional power series with easily computable coefficients. It does not require linearization, discretization, or small perturbation. To test simplicity, potentiality, and practical usefulness of the proposed algorithm, illustrative examples are provided. The approximate solutions of time-fractional Fokker–Planck equations are obtained by the residual power series method are compared with those obtained by other existing methods. The present results and graphics reveal the ability of residual power series method to deal with a wide range of partial fractional differential equations emerging in the modeling of physical phenomena of science and engineering.

Keywords: Caputo fractional derivatives, Fokker–Planck equation, residual power series, numerical algorithms.

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